

Acquisition Perspectives on the Incremental Commitment Model

16 June 2008

Dr. Peter Hantos
Software Acquisition and Process Department
Software Engineering Subdivision

Prepared for:
Space and Missile Systems Center
Air Force Space Command
483 N. Aviation Blvd.
El Segundo, CA 90245-2808

Contract No. FA8802-04-C-0001

Authorized by: Engineering and Technology Group

PUBLIC RELEASE IS AUTHORIZED; DISTRIBUTION UNLIMITED

Acquisition Perspectives on the Incremental Commitment Model

16 June 2008

Dr. Peter Hantos
Software Acquisition and Process Department
Software Engineering Subdivision

Prepared for:

Space and Missile Systems Center
Air Force Space Command
483 N. Aviation Blvd.
El Segundo, CA 90245-2808


Contract No. FA8802-04-C-0001

Authorized by: Engineering and Technology Group


PUBLIC RELEASE IS AUTHORIZED; DISTRIBUTION UNLIMITED

Acquisition Perspectives on the Incremental Commitment Model

Approved by:



Dr. Leslie J. Holloway, Director
Software Acquisition and Process Department
Software Engineering Subdivision
Computers and Software Division
Engineering and Technology Group



Donna M. Speckman, Director
Research and Program Development Office
Engineering and Technology Group

Integrating Systems and Software Engineering 2007

Acquisition Perspectives on the Incremental Commitment Model



Dr. Peter Hantos
Senior Engineering Specialist
The Aerospace Corporation

© 2007. The Aerospace Corporation. All Rights Reserved.



Acknowledgements

- This work would not have been possible without the following:
 - ❖ **Reviewers**
 - Suellen Eslinger, Software Engineering Subdivision
 - Dr. Leslie J. Holloway, Software Acquisition and Process Department
 - Mary A. Rich, Software Engineering Subdivision
 - ❖ **Sponsor**
 - Michael Zambrana, USAF Space and Missile Systems Center, Engineering & Architecture Directorate
 - ❖ **Funding source**
 - Mission-Oriented Investigation and Experimentation (**MOIE**) Research Program (Software Acquisition Task)

Agenda

- Objectives
- Incremental Commitment Model (ICM) – The 10,000 Foot View
- ICM and DOD (Department of Defense) Acquisition Life Cycle Model Phases
- Evolutionary Acquisition
- Selected Evolutionary Acquisition and Spiral Development Challenges
- Renaming Anchor Points in ICM
- Conclusions
- Acronyms
- References

Objectives

- Identify strengths and weaknesses of the new Incremental Commitment Model
- Explore to what extent the new model will mitigate known problems of the defense acquisition system

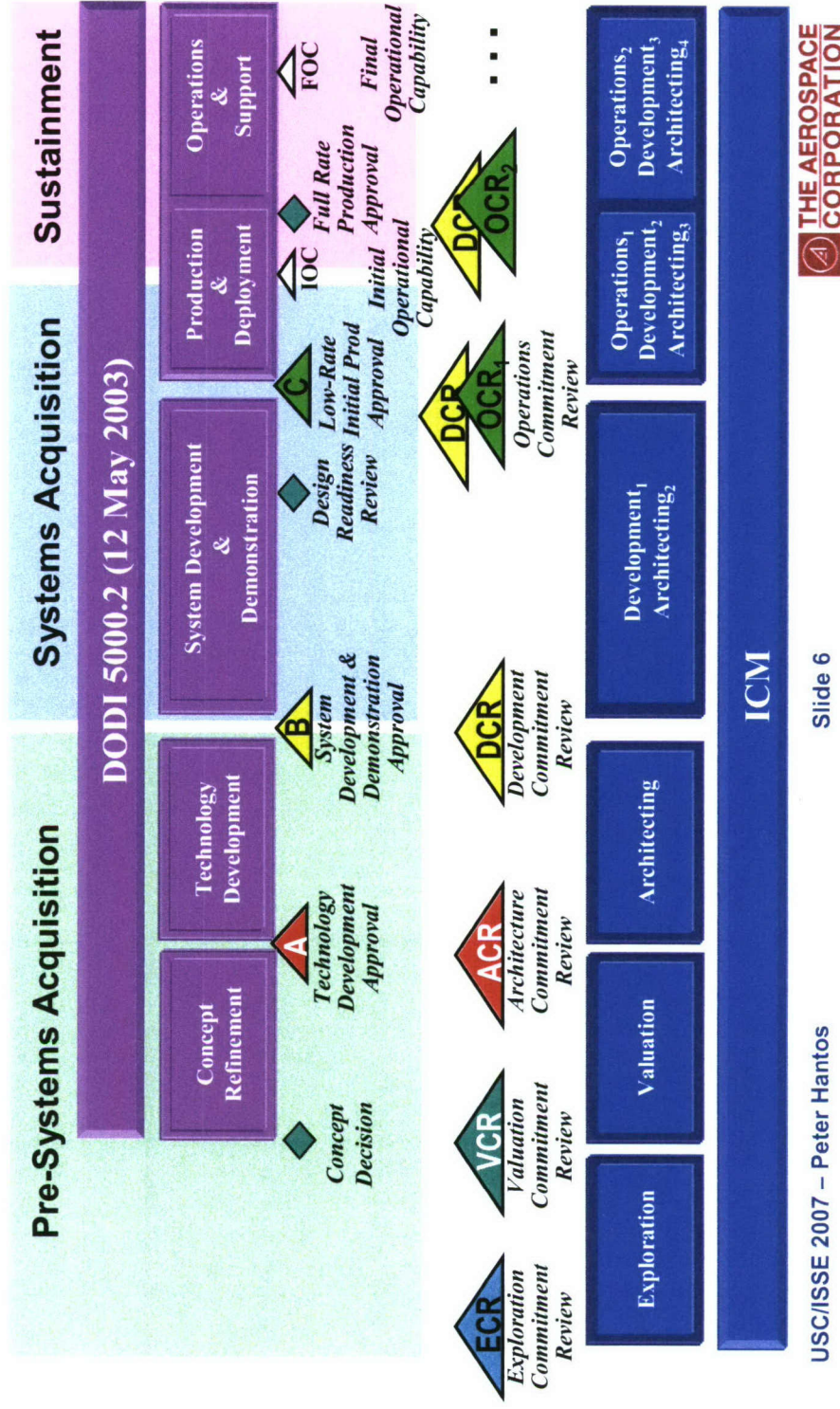
ICM - The 10,000-Foot View*

- **Based on and inherits most characteristics of the Spiral Model**
 - ❖ Risk-driven spiral planning is the most significant element
- **The uncoiled spiral metaphor replaces spiral**
 - ❖ Every spiral cycle maps into a life cycle phase
 - ❖ For depicting concurrency, builds on the well-known IBM/RUP® diagram of core process work flows
- **Major emphasis on formalized stakeholder commitment**
 - ❖ Anchor Point (AP) reviews are renamed to Commitment Reviews (CR)
 - ❖ The new Commitment Reviews emphasize life cycle phase-entry instead of phase-exit
- **Most CRs are aligned with DOD 5000.2 Acquisition Life Cycle Milestones (See next slide)**

* Discussion is based on [Pew 2007]

® RUP is registered in the U.S. Patent and Trademark Office by IBM/Rational Corporation

ICM and DOD Acquisition Life Cycle Model Phases



Acronyms
DODI Department of Defense Instruction
ICM Incremental Commitment Model

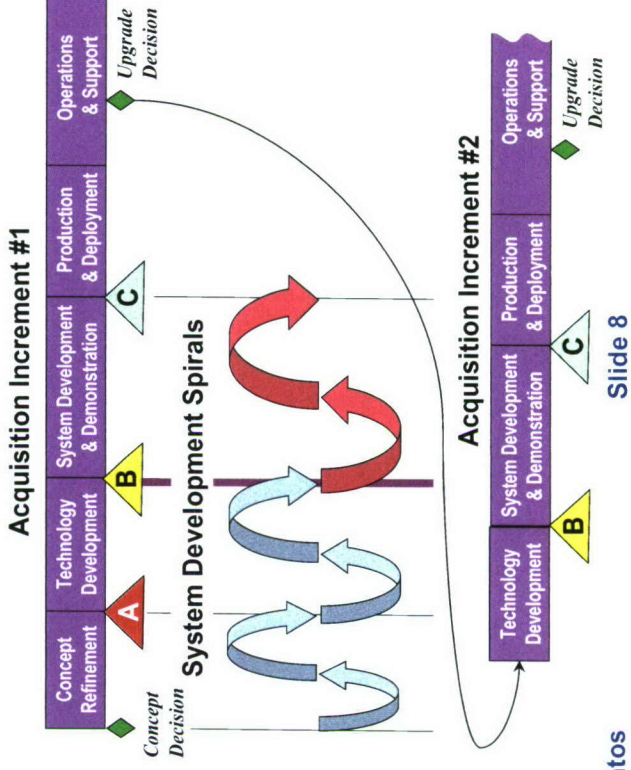
Evolutionary Acquisition

- **Current DOD direction embraces Evolutionary Acquisition (EA) and Spiral Development (SD)**
 - ❖ EA is an acquisition strategy, and SD is a development process
 - Note that unique life cycle models are associated with both
 - ❖ Per DOD 5000.2, SD is preferred because (supposedly) it supports EA
- **Current state**
 - ❖ EA is well understood and widely practiced
 - ❖ SD is still not well understood, sporadically practiced, and many times misrepresented

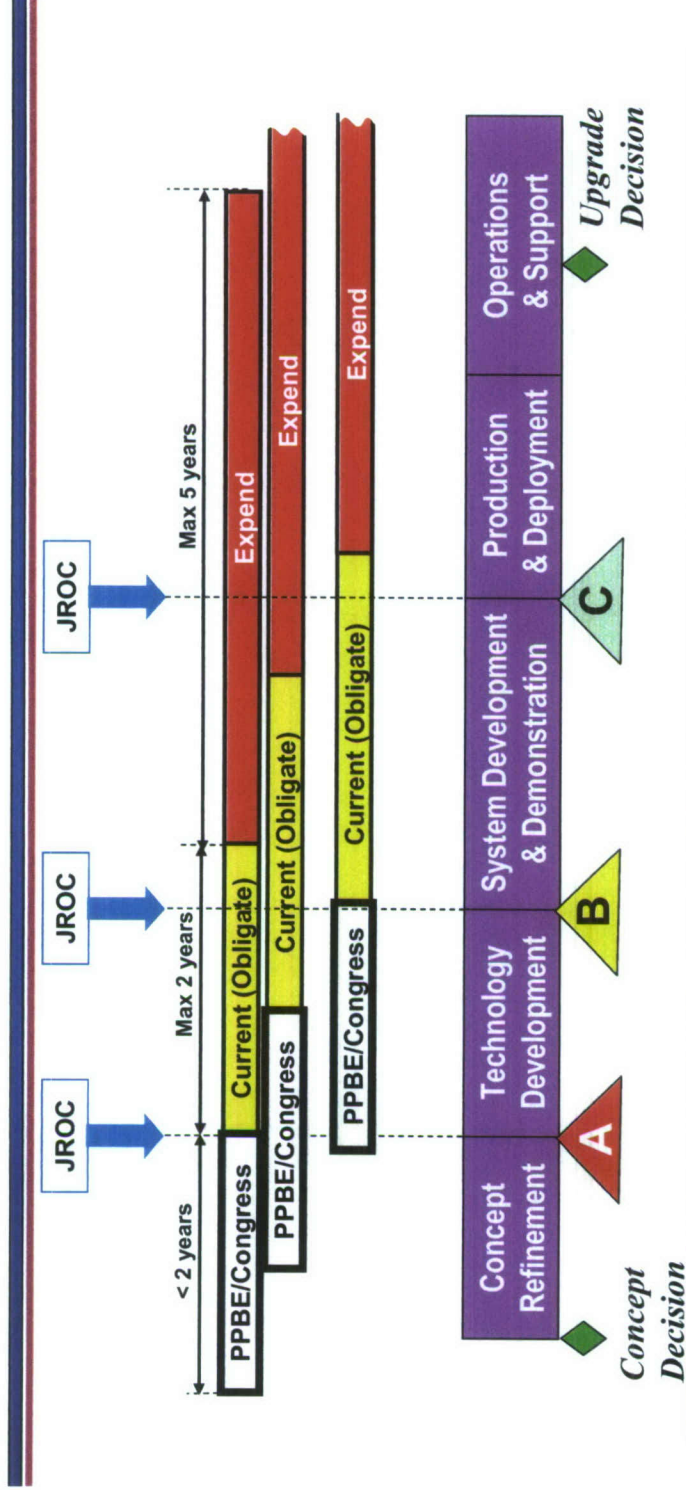
The following discussion is highly relevant, since ICM is a successor of the Spiral Model

Selected EA-SD Challenges

- Uncoiling the spiral and mapping it into DOD 5000.2 phases have been a concern from the beginning
 - ❖ Common interpretation is that spiral increments are mapped into DOD 5000.2 phases
 - This notion is reinforced by the fact that DOD 5000.2 requires risk-identification and risk-reduction activities in every phase



Spiraling After Milestone B is Problematic



After Milestone B, system requirements must be agreed to; this is needed to secure funding for the first acquisition increment. Spending of funds is highly constrained.

Legend: JROC: Joint Requirements Oversight Council

PPBE: Planning, Programming, Budgeting, and Execution. For details see [DODP 2003]

USC/ISSE 2007 – Peter Hantos

Slide 9

Bogeyman – The Nunn-McCurdy Breach

Reporting Thresholds	“Significant”	“Critical”
Current Baseline Estimate Is exceeded by	+15%	+25%
Original Baseline Estimate Is exceeded by	+30%	+50%

Congress is very closely monitoring cost growth.
Program re-baselining cannot be taken lightly.

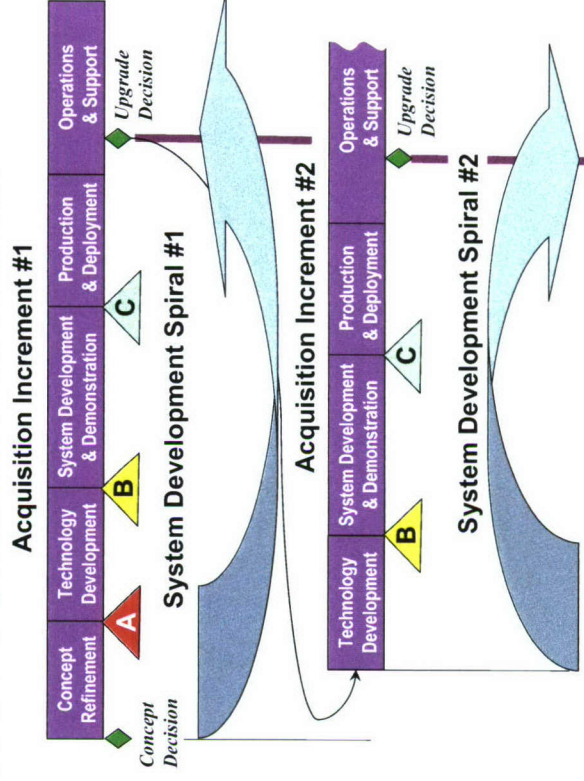
“Conventional” Risk Management vs. Risk-driven Spiral Planning in ICM Spirals

- **Conventional risk management (required by DOD 5000.2)**
 - ❖ Fundamental characteristics
 - Assigns a likelihood and impact value to the risk to facilitate prioritization
 - Simple monitoring is an acceptable way of handling risks
 - Most of the time a risk “burn-down” plan is put in place for risk mitigation
 - ❖ In all cases the contractor is supposed to have the costs associated with risk mitigation in the baseline
 - Alternative development paths and experiments might be chosen to deal with risks, but the contracted cost and schedule must not be impacted
- **Risk-driven spiral planning**
 - ❖ All parameters of upcoming increments are “up for grab”
 - ❖ Number of spirals should not be administratively limited
 - In fact, spinning-off iterations with engineering objectives, even without delivering any additional, useful functionality is an essential characteristic of iterative development

Iteration represents a sensible engineering approach, but might be incompatible with the overarching acquisition structure.

The Previously Shown Spiral Mapping Does Not Support EA

- The previously shown mapping of spiral increments has nothing to do with EA; those spirals are localized, internal matters of a single acquisition increment
- Spirals shown in the earlier mapping are far removed from the upgrade decision that triggers the creation of the new acquisition increment
- A more reasonable interpretation is as follows:



Renaming Anchor Points to Commitment Reviews in ICM

- CR equivalents of key Anchor Points
 - ❖ LCO (Life Cycle Objectives) → **ACR** (Architecture Commitment Review)
 - ❖ LCA (Life Cycle Architecture) → **DCR** (Development Commitment Review)
 - ❖ IOC (Initial Operational Capability) → **OCR** (Operations Commitment Review)
- **The new naming conventions emphasize the importance of stakeholder commitment at the entry to the next phase**
 - ❖ Pros and cons:
 - The positive impact is the reinforcement and codification of the principles that were used to create the Win-Win extension of the Spiral Model
 - The negative impact is that – inadvertently – the Anchor Point objectives got deemphasized

Conclusions

- **Strengths:**
 - ❖ ICM is a promising, new, development life cycle model
 - ❖ Recent ICM publications do contribute to the better understanding of spiral development principles
 - ❖ In ICM the original spiral graphical metaphor has been replaced with the uncoiled spiral, making the model's use easier for project managers
 - ❖ ICM emphasizes the importance of gaining stakeholder commitment before progressing to the next life cycle phase
- **Weaknesses:**
 - ❖ The renaming of APs to CRs deemphasized the earlier, important notion in the Spiral Model that all activities in a spiral increment are focusing on the satisfaction of the objectives of the upcoming Anchor Point
 - ❖ The mapping of ICM Anchor Points into the DOD 5000.2 milestones is artificial and not supportive of either the DOD 5000.2 Instruction in general, or its preferred, Evolutionary Acquisition strategy in particular

Acronyms

ACR	Architecture Commitment Review
AP	Anchor Point
CR	Commitment Review
DAPA	Defense Acquisition Performance Assessment
DCR	Development Commitment Review
DOD	Department of Defense
EA	Evolutionary Acquisition
ECR	Exploration Commitment Review
FOC	Final Operational Capability
ICM	Incremental Commitment Model
IOC	Initial Operational Capability
JROC	Joint Requirements Oversight Council
LCA	Life Cycle Architecture
LCO	Life Cycle Objectives
MOIE	Mission-Oriented Investigation and Experimentation
OCR	Operations Commitment Review
PPBE	Planning, Programming, Budgeting, and Execution
SD	Spiral Development
VCR	Valuation Commitment Review

References

- DODI 2003** DOD 5000.2 Instruction on the Operation of the Defense Acquisition System, May 12, 2003
- DODP 2003** DOD 7045.14 The Planning, Programming, And Budgeting System (PPBS); Certified current November 21, 2003
- PEW 2007** Pew, R., & Mavor, A., Human-System Integration in the System Development Process: A New Look, National Academies Press, 2007

Contact Information

Peter Hantos

The Aerospace Corporation

P.O. Box 92957-M1112

Los Angeles, CA 90009-2957

Phone: (310) 336-1802

Email: peter.hantos@aero.org

All trademarks, service marks, and trade names are the
property of their respective owners